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TELECOMMUNICATIONS R&D

Progress in 863 Plan Reviewed

90CF0371C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Jan 90 p 1

[Article by Han Yuqi [7281 3768 3825] and Mei Jianping [2734 1696 1627]]

[Text] China has obtained encouraging results in its ongoing high-tech research and development plan (the 863 Plan). Research efforts on 886 topics in five areas (biology, automation, information, energy and new materials) are in full swing. Results have been obtained in a number of projects. According to a recent review of about one-third of the projects, 125 of them have attained Class-A status.

In a recent high-tech experts conference held by the State Science & Technology Commission, Deputy Director Zhu Lilan [2612 7787 5663] described the status of the 863 Plan. Experts from the five areas and from the superconductivity field attended the meeting. According to Zhu, more than 7,100 people are participating in research projects under the 863 Plan. In 1989, strategic reviews were held for biology and automation.

Zhu and Ma Junru, Director of the High-Tech Basic Research Office in the State S & T Commission and coordination chief of the 863 Plan, each described the work plan for 1990. They said that the management-by-expert-committee system of the 863 Plan will be further improved. Based on previous results, a more subjective evaluation, control and monitoring system will be established. The management method will be made more scientific and institutionalized. Based on the Tentative Regulations of S & T Management for the 863 Plan established last year, other regulations will be completed.

Formulating the research directions for the Eighth 5-Year Plan of the 863 Plan is one of the major efforts of 1990. The 863 Plan should join forces with the "Torch Plan" and the "Key Project Plan" so that results may be converted into production as soon as possible.

Strategic reviews will be held this year for new materials, information technology and energy technology. The experts committee will be undergoing some age and specialty adjustments so that young and talented experts can soon be selected for the experts committee.

2.5 Billion Yuan Allocated for S&T Research and Development

90P60016 Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 23 May 90 p 1

[Summary] Beginning in 1990, the People's Bank of China will add an S&T loan program to its comprehensive loan plan. This year, the Bank will make available 2.5 billion yuan for S&T research and development, including 1.5 billion yuan for S&T development and 1 billion yuan for S&T special research projects. In order to coordinate with the national S&T extension program, banks have provided funds for special projects such as the S&T development discount loan, the 'Spark Plan' special loan, 'Torch Plan' special loan, 'Prairie Plan' special loan, S&T results special loan, and the 'three-in-one' launch [three satellites, one launch vehicle] loan. By the end of 1989, the Bank of Industry and Commerce and the Bank of Agriculture had granted a total of 1 billion yuan for S&T research and development. According to Rong Feng'e, head of the Fund Management Department, the People's Bank will increase the portion of S&T loans to speed up S&T development and applications. The Bank will also prioritize the investment fund to support high-tech products research and development, high-tech zones construction, and development of S&T enterprises, in order to utilize efficiently limited funds on quick-return, high-profit projects.

Key Sensor Technology Laboratory Established

90CF0371D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 13 Jan 90 p 1

[Article by Li Xigen [2621 0823 2704] and Bao Jiannong [7637 1696 6593]]

[Text] The Joint National Laboratory for Sensor Technology has recently passed the experts' certification checks in Shanghai. It has begun to shorten the distance between China's sensor technology standards and international standards.

The laboratory is located in the Shanghai Institute of Metallurgy and the Institute of Semiconductors of the Chinese Academy of Sciences; it also has nine stations in other research organizations in China. Since its establishment in 1987, the laboratory has built a series of advanced equipment, including a laser tuning system, a reactive ion etching system and a semiconductor parametric measurement system. In addition, it has also built two ultra-clean fabrication lines and formed a number of special stations.

In the last 2 years, the laboratory has reviewed and funded 39 research projects submitted by a dozen research units in China, and also actively worked on projects in the Seventh 5-Year Plan and high-tech projects under the 863 Plan. The laboratory has been active in semiconductors, infrared and biological sensor research, as well as in associated solid-state technology, device physics, and biochemistry. Today, the laboratory has developed high-temperature PH electrodes, glucose sensors, and penicillin field-effect sensors with a technical level that meets 1980 standards.

Guangdong Zhuhai High-Tech Industrial Park Formed

90CF0371E Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese 3 Feb 90 p 1

[Article by Chen Donglin [7115 2767 2651]]

[Text] With a 400-million-yuan investment by an industrial development general company, an open-style high-tech industrial park has been formed in Zhuhai, Guangdong. The park boasts an electronics zone, a light textiles zone, a fine machinery zone, and the associated research zone, trade zone, living quarters, and entertainment

area. According to preliminary data, this high-tech industrial park was responsible for a gross industrial output value in excess of 300 million yuan last year.

The strategic goal of the industrial park is to develop high-tech industries. Managers stress bringing in foreign capital, exporting products and the technology-intensive approach. They have collaborated extensively in economy, technology and marketing with industries and businesses in more than 20 countries and regions. Since 1985, when the first industrial parks were built, a dozen major projects in electronics, computers, refrigeration, machinery, and light textiles have been built using different funding schemes, including joint ventures, joint management, and domestic funding and management. These projects have been characterized by technology intensiveness, completeness and a high degree of automation. The major businesses are:

Based on computer disk technology, products related to magnetic recording and computer peripherals have been developed. Plants established included Meida Diskette Plant, Zhongda Diskette Plant, Cihai Hard-Disk Aluminum Substrate Plant, and Meihuan Computer Magnetic Head Plant. The facilities and technology of these plants are world-class and their products are all high-tech products. For example, the Meida Diskette Plant is China's largest plant for producing floppy disks for computers. Their diskettes are classified as import-replacement products and the annual output value is more than 10 million yuan.

Centered around overall electronics, new electronic components have been developed. Plants built include Mingri Electronics Plant, Xipu Electronic Components Plant, Xinyuan Electronic Components Plant, and Haisilu Electronics Plant. The output value of most of these plants has exceeded 10 million yuan.

Centered around compressors, a series of refrigeration equipment has been developed. The State has designated compressors as import-substitution items. The compressors built in this plant are all made with imported American equipment. The annual output value is more than 100 million yuan, annual profits are more than 20 million yuan, and per capita profit created is more than 20,000 yuan.

Centered on the watch-making industry, a series of watch and clock parts have been produced. Plants already built include Zhongrui Watch-Cover Plant, the Asia Watch Works, the Jinhai Watch Surface Plant.

Centered on textile production, a series of textile products have been developed. The Tianhe Textile Plant, with 120 textile machines and a system of dyeing machine, produces georgette and Dacron.

The Zhuhai Industrial Park is adhering to the role of a "window" for importing foreign high technology and for developing high-tech products. It contributes to the development of high-tech industries in four ways. First, in importing technology, the emphasis has been placed on new technology, new processes, and new equipment. Secondly, in term of organization, a special institute was established to guide the development of high technology. Thirdly, it attracts technical people engaged in high-tech research. In a few years, the industrial park has hired 600 engineers and managers at the middle level and higher. Fourthly, the park has improved the investment environment. Up to the end of 1989, more tahn 400 million yuan has been invested. Unified planning in production, research, education, living, transportation, communications, utilities, environmental protection, and ecological equilibrium has created an industrial-park type of investment environment for high-tech industrial construction.

New Technology Development Area Setup in Xi'an

90CF0371F Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese 3 Feb 90 p 1

[Article by Wang Zhicheng [3769 1807 2052] and Zhang Jianming [1728 1696 2494]]

[Text] The Beilin ["Forest of Steles"] high-tech zone in Xi'an has paid equal attention to technology development and service. To date, the high-tech zone has helped the community solve 41 difficult problems, transferred 140 new products to the community and created 4.80 million yuan of high-tech revenue.

This high-tech zone was established by the Xi'an municipal government based on the overall plan of the State Science & Technology Commission to build a new-technology market. It has taken advantage of the high density of colleges and universities in the Xi'an area, the advanced facilities at research institutes, and the complete range of defense-technology firms. It is part of the Xi'an experimental zone. After 2 years of building and development, the Beilin high-tech zone is taking shape. There are now 196 high-tech research units approved and open for business, employing 2,060 workers, with 85.6 percent of the workers technical personnel of medium rank or higher. A great majority of these people are retirees of universities, research units, and the defense industry. They not only have a good grasp of traditional knowledge, but also have rich experience for practice. By organizing these experienced retired people in work on research topics, there is a great potential for development. The Shaanxi Linear Electric Machinery Company has paid great attention to market trends and has developed products to suit the market: a total of 36 new products. They have independently developed a vehicle-control system with leading capabilities in China; to date, 210 units of this equipment have been bought by industry and the demand has exceeded the supply. The high-tech research unit at the Xi'an

Zhenxing Machinery Plant has turned its attention to the development of energy-conservation devices; they obtained four national patents in 1 year. Three of the four patented products have entered production and the annual output value is projected to be 10 million yuan.

Today, the Beilin high-tech zone in Xi'an is working in 15 high-tech development and service areas, including electronics, new materials, new drugs, geosciences, bioengineering, and opto-mechatronics.

Scientific Research Institutes' System Reform Studied

90CF0371A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 19 Feb 90 p 3

[Article based on "Recommendations for S & T System Reform," a report from the 6th Symposium on Institute System Reform of the Chinese Association of Research Institutes]

[Text] Advances in science and technology are the supporting force and strong underpinning of China's socialist economic subsistence, stability and coordinated development. In today's key moment of developing the depth of system reform in science and technology, we must consider the long-term benefits, pay attention to the stability of basic research capability and enhance the lasting power for scientific research. To this end, we offer the following analysis and recommendations regarding the major problems faced by China's research institutes.

I. There is a severe shortage of research funding and the actions taken are becoming more and more for short-term goals.

Since the State changed its system for allocating funds, and started reducing and managing the operating money according to classification, there have not been adequate allocations for the three categories of science and technology funding, and the funding sources for capital construction and technological reform have been exhausted. As a result, there has been a large discrepancy between the money allocated to the research institutes and the amount they actually need. The lack of funding for priority projects, combined with the nature of such projects—namely, the high degree of difficulty, the long period of time, the high risk for failure and the low income of the researchers—has caused morale problems in some research units engaged in basic research and national priority projects. They were forced to undertake some short-term, easier and faster development projects and technical consulting services. The trend toward short-term research is becoming more and more pronounced. The research quality and ability in research institutes are rapidly falling. If proceeding unchecked, the standards of China's science and technology will be greatly eroded.

Due to the lack of support, facilities and equipment for research have not been replaced in time and have become severely obsolete. Being unable to follow the direction of high-tech development, China is fallinb behind by an increasing margin. Because of the lack of research funds, China's main force in research has not fully realized its potential, and the status of basic research is unstable. There are widespread complaints among the research units that the lack of resources and staying power has prevented them from delivering to the society high-level research results on a continuous basis. The long-term planning and development and frontier research are also hampered by the shortage of support.

II. Psychological resilience is on the decline.

Research units are getting increasingly nervous about the market prices. On the one hand the research funds are shrinking, and at the same time the costs for energy, raw materials, construction and maintenance, equipment, and chemicals are going up rapidly. The increasing costs for conducting research have made the day-to-day operation of research very difficult.

To cope with the severe shortage of government research funds and to improve the living of researchers, research institutes have resorted to some technical consulting services and new-product development to create some income. These are one form of contribution to the state, but the government policy does not favor such activities. Instead, the research units were inundated with different taxes. In addition, the research institutes had to shoulder assignments from local governments and schools in order to maintain their social relationship. This situation has made it difficult for the research institutes to survive and grow.

III. The researcher rank is unstable and the legal interests of institutes are not protected.

From the perspective of a large picture, the government policy of allowing S & T personnel to pursue second occupations in their spare time is appropriate. However, because of the absence of detailed regulations and clearly defined limits, the collective interests of many research institutes have been violated. Some workers have been loyal to their second occupations for personal gain but not to their real job; as a result, the research institutes have been weakened. Some people even illegally brought research results and projects to the new units for development and hence caused great loss to their home institutes. Researchers engaged in major national projects who did not have time to pursue spare-time occupations have incomes far below that of those who did. This has caused great morale problems with researchers devoted to their real job and also has led to the anomalous situation of large discrepancies in effort and income between the real job and the second occupation. Due to the unfair distribution of compensation, there is a serious phenomenon wherein expertise is not rewarded. The low salaries of researchers cannot keep young workers at their posts. They are all trying to go abroad or to find work in the coastal region or in

"three-party enterprises" with higher pay and opportunities to go abroad. The talented ones are not going to remote regions or the countryside.

In view of these problems, we have the following recommendations:

1. Leaders at various levels should consciously build economic development on science and technology advances. The government should invest in S & T at a rate faster than that of the revenue income, and provide S & T development with a sound policy and environment.

2. S & T system reform should continue and a complete management system should be gradually formed. The reform policy should be further refined and specific reform targets and directions should be established. Policies should be formulated for national-level research institutes based on their nature, mission, and function. Different mission and requirements should be proposed and "across-the-board" practices should be avoided.

3. The state should increase the percentage of funds invested on high-priority projects and basic research and substantially increase the funding of priority disciplines.

4. Scientific research carries with it considerable risk and is highly exploratory. It is inappropriate to follow the taxing policy for industries. The state should adopt a preferential and supportive policy in order to enhance the economic and development ability of research institutes. We recommend that research institutes be exempted from paying energy and transportation construction funds, unbudgeted adjustment funds and intermediate-testing product taxes.

5. Create an atmosphere in the society that respects knowledge and talents. Fundamentally solve the problem of a reversed priority in treating intelligence and skill, and raise the social status of intellects. Consider giving S & T workers in remote regions an extra subsidy as an encouragement.

6. Make modifications to the policy of spare-time occupation. Such activities should have the responsible unit leader's approval and conducted in an organized manner. Contracts entered by individuals are inappropriate.

7. Find funding resources for research institutes to develop enterprises and to develop intermediate products as soon as possible. This could include S & T loans, removing some of the restrictions on S & T loans, and the provision of interest-free or low-interest loans as research funds for S & T.

Large-Scale Magnetic Screening Chamber Built

90CF0371B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 25 Jan 90 p 1

[Article by Xue Juqin [5641 5468 3830] and Ji Hongguang [1323 3163 0342]]

[Text] Beijing, 31 Jan—The first large-scale high-precision magnetic screening chamber independently designed and built in China has now been put into operation. This is a facility for making weak-magnetic-field measurements and experiments and can be used by China's scientists in geophysics, space physics, biology, medicine and other S & T disciplines.

The chamber weighs 8 tons and is located in the magnetic screening room of the zero-magnetism space experiment station in the Geophysical Institute of the State Seismological Bureau. It was built jointly by the General Iron and Steel Research Institute of the Ministry of Metallurgical Industry and the Geophysical Institute of the State Seismological Bureau. It is a spherical object with 26 facets, consisting of 18 squares and 8 equilateral triangles. The total interior volume is 8 cubic meters. The chamber was built on a unique design and used a number of new metallurgical techniques. Its static and dynamic shielding coefficients, stability and anti-interference ability, interior uniformity, and load-bearing ability all meet international standards for similar devices. Measurements have shown that the magnetic field in the chamber is less than 20 gammas, which is almost zero.

According to experts, there are only a few countries in the world that have mastered the technology for building large-scale magnetic screening chambers. The difficulty is to expel and shield the static earth magnetic field of 50,000 gamma and the magnetic field due to ULF and UHF electromagnetic waves, and thus to create a space with a stable super-low magnetic field. The main applications are: measurement and calibration of extremely weak magnetic fields, archeo-magnetic analysis of meteors and earth soil or rock to determine the age and geological structure for the purpose of mineral exploration, shielding the low-frequency command signals and high-frequency radiation signals of computers and microprocessors. The screening chamber not only prevents the leakage of state secrets, but also prevents spy satellites from eavesdropping or interference sabotage. It can also be used in the detection and analysis of weak magnetic signals from the human lung, heart, and brain, and for experiments involving space satellites in extremely weak magnetic fields.

Geological Disposal of Solid Wastes Studied

90CF0370A Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 2, 13 Feb 90 pp 5-10

[Article by Chen Mengxiong [7115 1125 3574] of the Ministry of Geology and Mineral Resources Science Advisory Commission: "Solid Waste and Pollutant Survey Research and Geological Disposal"]

[Excerpts]

I. Introduction

Environmental pollution caused by urban waste water and industrial waste water attracted attention in China

and foreign countries for some time now but environmental risks from solid wastes have not aroused sufficient concern in China yet. Solid wastes pollute the environment and destroy water resources. This is particularly true in regions with substantial concentrations of solid wastes, especially industrial cities. A substantial latent crisis of this type can be found in some areas of China. However, once the danger is discovered it is extremely hard to control.

The categories of solid wastes are extremely complex, but they can be divided into four main groups: 1) Urban household garbage; 2) Industrial residues; 3) Mining residues; and 4) Nuclear wastes and radioactive wastes.

Household garbage can be divided into the two main categories of organic matter and inorganic matter. The constituents of industrial wastes are extremely complex and different kinds of waste mateirals are produced in the machinery, metallurgical, construction, chemical, and other industries. Mining wastes vary according to the types of minerals developed in mines. They come in many categories and each poses different risks. Rapid development of nuclear power plants and various nuclear industries had made rational disposal of nuclear wastes an important research topic in the nuclear power industry. Moreover, failure to properly handle slag produced by mine, rock containing radioactive minerals, radioactive mateirals contained in certain polymetal mines, and Cambrian black shale from south China which contains relatively high amounts of radioactive matter once used for extracting bone coal in China can cause radioactive pollution.

Urban garbage as is it usually known mainly contains household garbage and industrial residues.

A 1989 survey showed that China's cities alone produce 60 million tons of garbage annually, double the amount 10 years ago. This includes about 40,000 tons daily in Shanghai (including 800 tons of household garbage, 3,000 tons of construction garbage, 20,000 tons of industrial garbage, and 7,500 tons of human waste) for a total of about 15 million tons a year, first among China's cities. Remote sensing data show more than 4,500 garbage dumps between the third and fourth ring roads in Beijing which occupy 9,300 hectares of land. Over 6 million tons are dumped each year. This includes about 2 million tons of household garbage and 4 million tons of industrial residues and other waste and earth which are beginning to encircle the city of Beijing. Some people call it the "Great Wall of Garbage". Indications are that at least two-thirds of China's 380-plus cities are being encircled by garbage.

Arbitrary dumping of urban garbage has become a primary source of surface water and groundwater contamination. Lanzhou City, for example, used household garbage and industrial residues as fill for Huang He shoals to expand its urban area, resulting in after effects on Huang He riverwater and groundwater which are difficult to control. The water source area at Yantan in the basin east of Lanzhou (which produces 60,000 cubic meters of water daily) has been abandoned due to severe degradation of groundwater quality from pollution by garbage. Matan water source area in the western basin is now seriously endangered and some producing wells have been abandoned. Because water contamination due to leaching of garbage proceeds slowly, it is extremely hard to control once it is discovered and will present no end of problems in the future. Similar situations, however, continue to occur. Yinchuan City, for example, used large amounts of completely untreated garbage to fill in some low-lying land. Changchun City dumps about 2 million tons of household garbage and industrial residues into Yitong He, including some waste from the chemical industry. Alluvial strata in Yitong He, however, are the main groundwater source for water supplies in Changchun. These garbage dumps have no inspections and employ no leakage prevention engineering or other environmental protection measures. They are becoming a pollution source which will be hard to control in the future.

The Beijing-Tianjin-Tangshan region is China's main base area for coal, chemical, electrical power, metallurgy, and other industrial production. Industries in these three cities dumped 17.39 million tons of industrial wastes in 1981. As the years have passed, the dumps now store 100 million tons which occupy over 15,000 μ of land. Moreover, all are open dumps totally lacking in environmental protection measures. Tangshan City now has over 20 large coal gangue heaps and seven ash storage yards which take up over 8,000 μ of land. Projections indicate that solid wastes in this region will expand to cover 20,000 μ by the end of this century and urban garbage will increase at an annual rate of 6 to 7 percent. Wanton dumping of large amounts of garbage and other wastes takes up a great deal of land and can pollute the soil and water, endangering society. Similar situations can be found in other cities and industrial regions. Conditions are even worse in places like Shenyang, Liaoyang, Anshan, Fushun, and other industrial cities in the Lower Liao He Plain. Thus, finding ways to rationally and scientifically deal with the problem of solid waste disposal can brook no delay.

II. Regular Solid Waste Disposal Methods

[Passage omitted]

China has just begun to be concerned with the question of urban garbage recycling, so the recovery rate at present is far too small. Usually, open dumps and sanitary landfills are the two methods commonly used for solid wastes that cannot be burned or utilized. Because of the lack of need of special investments and low costs of open dumping, all of China's cities now basically use open dumping (which is actually almost the same as arbitrary dumping). It is extremely easy to pollute the environment and transmit diseases in this manner, however, so most countries have abandoned this in favor of sanitary landfills. This involves selecting favorable topographic and geological conditions and

using rock quarries, low-lying land, or natural river valleys to establish artificial landfills which are also known as artificial waste repositories (including adoption of various types of leakage prevention engineering measures to prevent pollution). Special disposal mainly refers to using deep burial sealing and other special measures for radioactive wastes, nuclear wastes, and certain toxic wastes like cyanide and mercury compounds, waste farm chemicals, and so on to guarantee absolute safety since regular landfill methods cannot be employed. As a result, geological conditions are even more important.

III. Geological Disposal of Solid Wastes

[Passage omitted]

Based on the present situation in China, we should immediately conduct a regional environmental geology survey of solid wastes for our main cities to clarify the distribution and danger of garbage and suggest a program for rational readjustment of garbage dumps and geological disposal. The concrete tasks are:

1. Determine the location, distributional areas, and quantities of solid waste dumps.

2. Clarify categories and primary components of solid wastes, evaluate conditions for using all types of wastes, and use artificial extraction and testing of chemical components filtered out of representative wastes to predict the primary pollutants which will affect groundwater quality.

3. Determine geological and hydrological conditions and different types of wastes in existing solid waste dumps and groundwater contamination under different geological conditions, including avenues of pollution, range of pollution, extent of pollution, and primary toxic components, and inspect for relevant elements, ions, and dissolved oxygen (DO), biochemical aerobiotic quantities (BOD_5, organic carbon (TOD), and other contents which are indicators of pollution. Classify all dump sites on the basis of different conditions and quality of conditions to suggest programs for rational readjustment and geological disposal.

4. Select key solid waste dumps where pollution has already occurred, do preliminary exploration work and water sampling experiments, gain an understanding of the structure of dump strata and the lithology of gas-bearing zones, take water samples of each stratum, and clarify the liquid seepage situation. Geophysical exploration methods can also be adopted like using electrical methods in a certain area of Florida in the United States in 1984 to reveal a 250-acre low resistance region in a landfill which indicated the range of expansion in liquid seepage. This illustrates successful applicaiton of geophysical methods to determine seepage migration regions and their vertical range.

5. Do surveys to select sites for waste landfills and propose concrete requirements and engineering measures for scientific filling. Examples include concrete requirements for the thickness of fill by strata, degree of compaction, installing leakage barriers, or requiring construction of leakage prevention dams, and so on.

6. Do comprehensive monitoring work for regional or key dumps and establish monitoring systems. Do laboratory simulation experiments and field experiments, and gradually develop trend forecasting.

[Passage omitted]

V. Geological Disposal of Nuclear Wastes

[Passage omitted]

Over the past few years, relevant departments in China have done preliminary geological prospecting work to select storage sites for nuclear wastes. China has vast frontier regions. From a long-term perspective, we should work on a national scale to establish three or four nuclear waste storehouses. For this purpose, we should first of all do large-area site analysis and comparison work in all regions. This is a new task in China, so we should be concerned with absorbing experiences from advanced nations.

VI. Conclusion

1. It is extremely easy for arbitrary dumping of solid wastes to cause environmental pollution. This is especially true for seepage of pollutants into groundwater. It is an extremely slow process that is hard to control once it is discovered. Urban garbage in China is still in a state of unplanned arbitrary open dumping which is extremely dangerous. Thus, we cannot delay in conducting environmental geology surveys for solid wastes in all major cities and carrying out geological disposal to rationally readjust dumping sites.

2. Adopt comprehensive control measures for urban solid wastes based on concrete conditions in China. We should try to convert urban garbage into resources for everything that can be sorted out for processing into recycled resources. Comprehensive rational readjustment should be made by surveying existing open dumps. All sites which are not causing serious pollution can be retained for the time being, but the necessary compensation measures should be adopted. All sites which are already causing serious pollution should temporarily cease utilization and methods for control should be proposed. In addition, we should work as quickly as possible to select sites for building scientific sanitary landfills.

3. Due to the extreme complexity of factors involved in solid waste disposal like selection of landfill sites, design of fill structures, establishment of trend forecasting and monitoring systems for solid waste pollution, sifting and utilization of garbage, and so on, they concern many disciplines including hydrogeology, engineering geology,

chemistry, microbiology, environmental engineering, and so on. A new comprehensive and independent discipline in the environmental sciences is now taking shape. It is still in the developing stages, however, both in China and in foreign countries, and the theories involved require further improvement and perfection. They have just begun in China, so we should focus on absorbing achievements in foreign countries, reinforce theoretical research, and conscientiously summarize experiences in China. Geological departments should work closely with environmental protection departments and other related fraternal departments to integrate for solving realm problems which exist now and intensively develop scientific research work.

4. We should also begin working immediately on survey research on a national scale for site selection for nuclear waste repositories. Integrate with the deployment of the nuclear industry and nuclear power plants and use regional surveys and analytical comparison to select three or four sites for detailed prospecting research.

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Status, Prospects of Space Industry Reviewed

40100057a Beijing BEIJING REVIEW in English Vol 33 No 21, 21-27 May 90 pp 13-16, 21

[Unattributed article; first paragraph is editor's introduction]

[Text] China has set up a multi-launching missile system, which has brought to the world's most advanced level China's technology in the field of satellite recovery, multiple missile launching with a single rocket, satellite survey and control and the high-energy cryogenic fuel rocket. The following article recounts the historical development of China's space industry.

Not long after the founding of the PRC in 1949, the Central Committee of the Communist Party of China, headed by Chairman Mao Zedong, made an important decision: While energetically developing the national economy, China must strengthen the building up of the national defense in order to guarantee state security and independence, protect the economic construction of New China and maintain China's international standing.

In 1956, China established a missile research institute. When the Soviet Union launched the world's first man-made satellite in October 1957, Chairman Mao Zedong foresaw the full impact of astronautic technology on mankind and issued the call, "We should also develop satellites." Even in 1960 when China's national economy was beset by serious difficulties due to natural calamities and other causes, Chairman Mao still proposed, "We must make up our minds to develop sophisticated technology. The development of sophisticated technology must not be relaxed, to say nothing of stopped." Also, the Party Central Committee made a relevant decision regarding the development of sophisticated technology and the Central Military Committee of the CPC Central Committee further defined the principle of developing both missiles and atom bombs, giving priority to the former. Under these circumstances, China basically established a test base for missile research, producing and launching from 1959 to 1961, a time when China's national economy met with temporary difficulties. In 1962, a special committee of the central authorities headed by Premier Zhou Enlai was set up to lead the work for developing the sophisticated technology of the defense industry, including space technology, thus ensuring great achievements in this area in the mid-1960s. During the 10-year turmoil (1966-76), the space industry was heavily undermined and buffeted, but Premier Zhou Enlai and other party and government leaders adopted various measures to protect the ranks of astronautic scientific and technological personnel so that some key projects could be carried out uninterruptedly and tremendous achievements could be attained.

Thanks to the joint efforts made by scientists, technicians, cadres and workers on the astronautic front over the past more than three decades, China's space industry, starting from scratch, has grown rapidly. A fairly large, relatively complete space industrial system, that combines scientific research, production and education, ahs been established. The industry has made great contributions to the strengthening of China's national defense and economy.

To date, China has developed many kinds of tactical and strategic missiles and carrier rockets and is able to produce short-, intermediate- and long-range and intercontinential missiles, as well as ground-to-ground and underwater-to-air missiles. It initially has set up a missile system of multiple-range missiles and various types of launching methods, providing China with a nuclear counterattack deterrent force. In the field of tactical missiles, an all-space missile system for air and coastal defense has been formed. Breakthroughs have been made in the development of ground-to-ground missiles, and 27 man-made satellites have been launched successfully.

At present, in some important aspects, China's space technology has entered the ranks of the world's most advanced. For instance, China has successfully recovered 11 satellites and has become the third country in the world (after the United States and the Soviet Union) to master satellite recovery technology. After the Soviet Union, the United States and the European Space Agency (ESA), China is the fourth country to have launched a number of satellites using a single carrier rocket. In satellite surveying and controlling technology, China has established a TTC network composed of more than 10 ground observatories with surveying, controlling and communications centers and telemeter control vessels. After the United States and France, China is the third country to master high-energy cryogenic guel rocket technology, which represents a new level of modern rocket technology. In earth synchronous orbit satellite launching technology, China is one of five countries in the world that can launch satellites with such technology.

Depending on Socialism

Space technology involves vast, complicated systems engineering. Satellite communications engineering, for example, includes four big systems—satellite carrier rocket, launching site, TTC network, and ground communications network, and involves many branches of learning, specialized subjects and technologies. It demands well-organized work, coordinated actions, unified leadership and good cooperation among various fields. In a word, it requires a high level of planning. To develop a space industry, particularly in an underdeveloped socialist country like China which is hampered by a shortage of qualified scientists and technicians as well as funds, it is all the more necessary to bring into play the unique superiority of a socialist planned economy, concentrate forces, and organize coordination on a national scale in order to solve key technical problems. Only in this way can China quickly advance its space technology in a short time.

To ensure the supply of various kinds of high temperature-resistant materials, high purity fuels, high-strength steel, precision alloys, rare metals, semiconductors, compound materials and rare gas for the space industry, the departments under the State Council, scientific research institutes and relevant factories, colleges and universities have cooperated in tackling key problems. From 1960 to 1966, nearly 4,000 kinds of new materials had been developed. The electronics and machine-building industries adopted strict management measures to ensure the development of products for the space industry and, therefore, very quickly, all the materials needed for making carrier rockets were being produced in China.

In cooperating, each department took the entire situation into account and selflessly contributed whatever the space industry needed in respect of manpower, materials and technology, fully displaying the political and economic superiority of China's socialist system. The manufacture of the Long March II carrier rocket, for instance, involved more than 4,000 projects undertaken by 1,300 industrial and mining enterprises, research institutes, colleges and universities under 27 ministries and commissions and 25 provinces, municipalities and autonomous regions. When it was being launched, tens of thousands of people from various posts (launching, survey and control, telecommunications, transportation, hydrological, meteorological, secruity and materials supply) in more than 20 provinces and municipalities and the PLA participated in the work under the unified command of the Commission of Science, Technology and Industry for the National Defense.

Chairman Mao Zedong pointed out, "We stand for self-reliance. We hope for foreign aid, but cannot be dependent on it; we depend on our own efforts."

Self-Reliance

Recalling the historical development of the space industry of more than 30 years, we see that an important experience is to steadfastly uphold the principle of independence and self-reliance, while actively learning and introducing foreign advanced technology. As early as the founding of the industry, Chairman Mao Zedong and Premier Zhou Enlai approved the construction policy put forward by Marshal Nie Rongzhen: "To relychiefly on our own efforts while striving for foreign aid and fully using scientific achievements made by capitalist countries." In the 1950s, the Soviet Union gave us some technical assistance in the development of liquid-propellant rocketry. However, from the beginning, we took its assistance as a means of strengthening our self-reliance. In the modeling and research process, we tried our best to master design and manufacturing skills. Therefore, we could immediately do our own designs and independent research when foreign assistance in this regard was suspended. From the 1960s, all our tactical and strategic missiles, carrier rockets and man-made satellites were developed through our own efforts under conditions of foreign blockade. The success fully showed the intelligence, wisdom and great strength of the Chinese people. This demonstrates that foreign blockade and sanctions may bring us some temporary difficulties, but from a long-term point of view, it spurs us on to stand on our own feet.

After the Third Plenary Session of the 11th Party Central Committee, China adopted the open policy, and great changes also took place in the world, providing favorable conditions for China to actively develop international cooperation and exchanges, import technology, capital and talents, and expand exports. The result is that China's self-reliance has been enhanced. Nevertheless, China still can introduce only some ordinary technologies. The actual advanced technologies, especially space technology, are still highly restricted and not available to China.

Policy Redefined

Not long after the Third Plenary Session of the 11th Party Central Committee, Comrade Deng Xiaoping, analyzing the international situation scientifically, came to the conclusion that a large-scale world war would be unlikely to break out for a long time to come. According to this judgement, the Party Central Committee and the Central Military Commission of the CPC Central Committee once again defined the policy for the building up of national defense and formulated the policy for the defense industry: "The industry should develop both military and civilian products, the plan for peace time should be combined with a plan for war time, give priority to the development of military supplies, and the military industry should produce civilian goods to support itself." From then on, the space industry began to change from solely a military industry into a combined military and civilian industry, and from looking inwardly to looking outwardly. Over the past few years, while fulfilling scientific research and production targets for weaponry, the space industry, using its advantages in technology, equipment and personnel, made great efforts to readjust product mix and develop civilian products and foreign trade. It has made a good start in developing civilian products. A large number of astro-physical data collected by scientific experiment satellites provided first-hand materials for the study of space basic science; photos taken by land survey satellites have been widely used in land and geological survey, petroleum prospecting, cartography and environmental monitoring; the communications satellites launched by China have enabled the country to realize nationwide television, broadcasting and communications coverages.

Making full use of its technology, equipment and talents, the space industry has supplied a large amount of equipment and technology to the light, textile and chemical industries. Major efforts have also been devoted to the development of civilian products such as automobiles, motorcycles, refrigerators and air conditioners. The current output value of civilian products amounts to around 70 percent of the industry's total.

While concentrating on the domestic market, the space industry has done its best in recent years to open up an international market and develop exports. The Long March II, III and IV carrier rockets developed by China have begun to serve foreign countries. For instance, in 1987 and 1988, using a recovery satellite, China supplied carrying services to France and the Federal Republic of Germany, while in April 1990, China used its modified Long March III carrier rocket to successfully put into orbit the Asiasat-I, an American-made telecommunications satellite. This signaled the entry of Chinese space technology into the international commercial market.

Strong Technological Forces

In a developing country like China, the major factor in the rapid development of space technology is a strong scientific and technological contingent. In the development of the space industry, a large number of people at a high technological level and with a fine working style have matured. Among them there is a batch of famous experts who, cherishing high patriotic ideals and overcoming various obstacles, returned to the motherland from foreign countries after the People's Republic was founded and threw themselves into the building up of New China's space industry, making great contributions. Most of the cadres, workers, scientists and technicians grew up after liberation. They take pride in working under difficult conditions and give no thought to personal fame, position or pay. Their deeds mark them as the backbone of the space industry and an important segment of the entire country's most highly-qualified scientific and technological workers.

Among the large number of experts emerged in the space industry are Qian Xuesen, Ren Xinmin, Liang Shoupan, Tu Shoue and Huang Weilu, who played a leading role in its development.

Although China has achieved a great deal in its space industry, it still has a long way to go to reach the world advanced level. Since the 1980s, the developed countries, one after another, have formulated plans for developing high technology, and some developing countries have also taken the building of space technology as a national policy.

Deng Xiaoping said, "If China had not exploded atom and hydrogen bombs in the 1960s and launched satellites, it would not have been considered one of the three big powers and would not occupy such a position in the world. These things can mirror the capability of a nation and symbolize a country's vigor and prosperity." He also noted, "Be it in the past, present or future, China must take a place in the high-tech arena." According to its national conditions and the requirements of the four modernizations, China is set to develop a new generation of astronautics equipment in the 1990s. This year it is to launch several satellites of diversified functions and to further expand international cooperation in the field of astronautics.

Satellites Launched by China

Since 1970, China has successfully launched 27 man-made earth satellites

24 April 1970	The "Dongfanghong" (The East Is Red) Satellite No 1
3 March 1971	A scientific experimental satellite
26 July 1975	A technological experimental satellite
26 November 1975	A recoverable satellite
16 December 1975	A technological experimental satellite
30 August 1976	A technological experimental Satellite
7 December 1976	A recoverable satellite
26 January 1978	A recoverable satellite
20 September 1981	For the first time, sent into predetermined orbit by a single carrier rocket a group of three space-physics experimental satellites
9 September 1982	A recoverable satellite
19 August 1983	A recoverable satellite
29 January 1984	An experimental satellite
8 April 1984	An earth synchronous orbit communications satellite
12 September 1984	A recoverable satellite
21 October 1985	A recoverable satellite
1 February 1986	A communications satellite
6 October 1986	A recoverable satellite
5 August 1987	A recoverable satellite
9 September 1987	A recoverable satellite
7 March 1988	A communications satellite
5 August 1988	A recoverable satellite
7 September 1988	China's first experimental meteorological satellite
22 December 1988	A communications satellite
4 February 1990	A communications satellite
7 April 1990	AsiaSat-I

Study of Isolation, Purification, Biological Properties of Nuclear Polyhedrosis Virus of *Ecpterote Sapivora*

40091011m Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 30 No 2, Apr 90 pp 161-164

[English abstract of article by Dai Caiyun [2071 1752 0061] and Zheng Maocai [6774 5399 2624] of the Institute of Tea, Guizhou Province, Meitan; Tang Xianchun [3282 7359 2504], et al., of Wuhan Institute of Virology, Chinese Academy of Sciences]

[Text] A nuclear polyhedrosis virus was isolated from larvae of *Ecpterote sapivora* Yang that had died naturally. By means of isolation, purification, morphology observation and studying biological properties, the authors determined that the virus belonged to baculovirusidae *Baculovirus*. The isolation of nuclear polyhedrosis (EcNPV) from *Ecpterote sapivors* (moth) is the first ever conducted.

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Transposon Tn5 Mutagenesis in *Citrobacter*

40091011l Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 30 No 2, Apr 90 pp 112-116

[English abstract of article by Wang Aoquan [3769 2407 0356], Yin Ping [1438 5493] et al., of the Institute of Microbiology, Chinese Academy of Sciences, Beijing]

[Text] When *E. coli* 1830/PJB4JI was mated with four *Citrobacter* strains, all were Kanamycin resistant, but a majority of Kan^rGen^s transconjugants were obtained from C-3-1. Among 3,000 Kan^rGen^s, 21 were auxotrophs, including Lys^-(1), Ura^-(1), Arg^-(2), Iso^-(2), His^-(2), Met^-(1), Phe^-(1), Tyr^-(1), Ser^-(1), Thr^-(1), Leu^-(3), Pro^-(1), Ade^-(3), and Lac^-(1). PJB4JI plasmid DNA was detected in the parent strain *E. coli* 1830, but not in the auxotrophic strains carrying Tn5 induced mutations. Twenty auxotrophic chromosome DNAs were hybridized with Tn5 DNA labeled with ^{32}P, and all auxotrophs had positive reactions. Therefore, the authors conclude from genetic and physical data that the auxotrophs resulted from Tn5 transposition from PJB4JI into the C-3-1 chromosome.

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Effect of Suppressor tRNA on Translation of Tomato Mosaic Virus RNA, Its Inhibition on Virus Multiplication in *Tobacco*

40091011k Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 30 No 2, Apr 90 pp 105-111

[English abstract of article by Wang Xiaofeng [3769 1420 7685], Li Fengzhi [2621 0023 4249], et al., of the Institute of Microbiology, Chinese Academy of Sciences, Beijing]

[Text] Suppressor tRNAs were isolated and fractionated by BD-cellulose from a temperature mutant SUP 6-1 of *Saccharamyces cerevisiae* (containing SUP-$tRNA^{Tyr}$, SUP-$tRNA^{Leu}$, SUP-$tRNA^{His}$) and a spinach plant. Both tRNAs could promote the production of 183k

readthrough protein products of ToMV-RNA in a rabbit's reticulocyte lysate translational system.

The effect of the yeast SUP 6-1 suppressor tRNA on the multiplication of ToMV in *tobacco* was studdied. An inoculation experiment showed that virus titers tested 3, 5, 11, 15 and 20 days after inoculation in the top leaves of tobacco treated with the suppressor tRNA were 3, 12, 38, 62, and 67 percent, respectively, when compared to those of the control.

Virus titers in the middle leaves treated with suppressor tRNA are apparently lower than those of the control after 11 to 20 days. No significant differences in the virus titers of the lower inoculated leaves were found between those receiving the suppressor tRNA treatment and the control. The possible mechanism for this inhibitive effect is discussed.

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Development of New System for Selection of *Aspergillus Foetidus* Transformed with Foreign Genes by Using Thymidine Kinase Gene as Marker, Expression of HBsAg Gene in *A. Foetidus*

40091011j Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 30 No 2, Apr 90 pp 98-104

[English abstract of article by Liu Hongdi [0491 1347 6611], et al., of the Institute of Microbiology, Chinese Academy of Sciences, Beijing; Cao Xu [2580 2485], et al., of the Institute of Virology, Chinese Academy of Preventive Medicine, Beijing]

[Text] A new system intended for the selection of transformed *Aspergillus foetidus* is reported. In this system, TK^- *A. foetidus*, constructed through homologous recombination of a mutated TK gene of the vaccinia virus with the TK gene of *A. foetidus*, were screened by adding BUdR in agar plates. The conditions for screening the TK^+ *A. foetidus* strain, transforming *A. foetidus* and selecting the transformed TK^- *A. foetidus* have been studied. By using this system, several transformed *A. foetidus* containing the HBsAg gene derived from a promoter H8 cloned from genomic DNA of *A. foetidus* were isolated. It was demonstrated by Southern blot that the HBsAg gene was integrated into the chromosome DNA of *A. foetidus* after the passage of many spores. ELISA showed that the HBsAg was positive in the growth medium (p/n = 20). Some 22 nm particles which were very similar to the HBsAg particles in human serum were found in the growth medium by immunoelectronmicroscopy. Western blot provided the specific bands. All these data show that the HBsAg has been expressed in *A. foetidus* and the products secreted into the growth

medium. The selection system using the TK gene as a marker can generally be used to study the expression of foreign genes in *A. foetidus*.

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Cloning, Study of Replication Origin of Integrated F Plasmid in *Escherichia coli*

40091011i Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 17 No 2, Apr 90 pp 148-153

[English abstract of article by Mao Yumin [3029 5940 3046] and Sheng Zujia [4141 4371 0857] of the Institute of Genetics, Fudan University, Shanghai; supported by the National Natural Science Foundation of China (3870279)]

[Text] The replication origin of the integrated F' plasmid was cloned by means of marker rescue. No difference in incompatibility or acridine orange sensitivity was found between the mini-F plasmid constructed from this origin and the autonomous F' plasmid. Subcloning and comparative restriction enzyme analysis was carried out with the replication origin from the integrated F' plasmid and the automonous F plasmid. No structural differences were found between them. These results suggest that the difference in the dependence of the *recA* gene between the F and F' plasmids does not come from any difference in structure of their replication origin, but probably from their site of integration on the chromosome.

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Cloning, Expression of Promoter Function Fragment from *Thiobacillus thiooxidans* in *Escherichia coli*

40091011h Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 17 No 2, Apr 90 pp 143-147

[English abstract of article by Yan Wangming [7346 2598 2494] of the Institute of Microbiology, Shandong University, Jinan]

[Text] This paper reports a recombinant plasmid pSDR12 which is constructed through replacing the *Eco*RI-*Hind*III fragment of pBR322 with a specific fragment of chromosomal DNA of *T. thiooxidans*. After being transformed into C600, the transformants reveal higher levels of Tc resistance. These results show that a promoter function fragment from autotrophic bacteria can be expressed in *Escherichia coli*.

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Rapid Restriction Mapping of DNA Cloned in Cosmid, Lambda Phage Vectors

40091011g Beijing YICHUA XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 17 No 2, Apr 90 pp 136-142

[English abstract of article by Chai Jianhua [2693 1696 5478] of the Institute of Genetics, Fudan University, Shanghai]

[Text] A procedure for the rapid restriction mapping of cosmid or lambda phage clones has been developed. The mapping of cosmid is based on the linearization of circular cosmid DNA *in vitro* by the phage λ terminase. Partial digestion products are selectively labeled at the right or left cos cohesive termini by hybridization with [^{32}P] oligonucleotides, complementary to the single-strand cos end. After gel electrophoresis and autoradiography, the restriction map can be directly determined from the "ladder" of partial digestion products of cosmid or lambda clones with a computer program or by hand.

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Effect of Pollen in Enhancing Tolerance to Hypoxia, Promoting Adaptation to Highlands

40091011f Beijing ZHONGHUA YIXUE ZAZHI [NATIONAL MEDICAL JOURNAL OF CHINA] in Chinese Vol 70 No 2, Feb 90 pp 77-81

[English abstract of article by Peng Hongfu [1756 3163 4395], Xue Zhensheng [5641 2182 5116], et al., of the Research Institute of Hygiene and Environmental Medicine, Military Medical College]

[Text] Mixed pollen containing four kinds of pollens (rape, typhae, corn, sunflower) has been proven to have many biological effects. It is capable of increasing the body's tolerance to acute hypoxia and promoting adaptation to the highlands.

The experimental study shows that pollen can significantly increase the body's tolerance to acute hypoxia. Pollen can also increase the high energy content and normalize the activity of several enzymes which are important to high energy metabolism, regulate the neurotransmitter in four parts of the brain and maintain normal activities in the nervous system, increase the secretion of the adrenocortical hormone which may encourage O_2 absorption, increase the SOD content in tissues (heart, liver), hence preventing superoxygenation and guarding against free radicals, increase PO_2 in the brain and arterial blood, decrease the oxygen consumption and blood lactic acid concentration, and increase the immunity of animals under normal conditions.

Pollen has neither acute nor chronic toxicity and causes no allergic reactions. In the field study, pollen was also shown to reduce and ameliorate symptoms of acute mountain sickness in humans.

Study of Monkeys Experimentally Infected with Epidemic Hemorrhagic Fever Virus

40091011e Shanghai ZHONGHUA CHUANRANBING ZAZHI [CHINESE JOURNAL OF INFECTIOUS DISEASES] in Chinese Vol 8 No 1, Feb 90 pp 25-28

[English abstract of article by Xu Xiao [1776 2556], Wang Jiwu [3769 1323 0582], et al., of Zhejiang Medical University, Hangzhou]

[Text] Five newborn monekys were experimentally infected with epidemic hemorrhagic fever (EHF) virus to seed the target organs of the virus. Regarding the 13 organs of each monkey tested, the EHF virus and its specific antigen were found to be positive in the spleen, lymph nodes, thymus, liver and lung, while no evidence of the EHF virus infection was observed in the other eight organs, i.e., the brain, hypophysis, kidney, adrenal gland, heart, thyroid gland, intestine and gall bladder. EHF virus with higher titers and longer duration was found in the spleen, lymph nodes and thymus than in the liver and lung. The viremia, fever and specific antibody response observed in patients and monkeys were found to be similar.

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Norfloxacin in Treatment of Acute Shigellosis

40091011d Shanghai ZHONGHUA CHUANRANBING ZAZHI [CHINESE JOURNAL OF INFECTIOUS DISEASES] in Chinese Vol 8 No 1, Feb 90 pp 19-21

[English abstract of article by Mei Qin [2734 5367], Wang Qinan [3769 0366 0589], et al., of the Department of Infectious Diseases, First Affiliated Hospital, Chongqing University of Medical Sciences]

[Text] Fifty-three patients with acute shigellosis, confirmed by stool cultures, were studied. They were divided into two groups: one was treated with norfloxacin, 500 mg 3 times daily for 7 days, while the other was treated with gentamicin, 80,000 u im every 12 hours, and trimethoprimsulfamethoxazole (TMP-SMZ), 2 tablets twice daily for 7 days. Of the 30 patients treated with norfloxacin, 29 were clinically cured (96.67 percent), and the bacterial eradication rate was 100 percent. Of the 23 patients treated with the gentamicin/TMP-SMZ combination, 15 were clinically cured (65.22 percent), and 4 of the 8 failures had persistently positive stool cultures (bacterial eradication rate 62.61 percent). There were significant differences in clinical cure rates ($p < 0.01$) and bacterial eradication rates ($p < 0.05$) between the two groups. Therefore, norfloxacin can be considered to be the drug of choice when treating acute shigellosis.

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Study of Susceptibility of Human Endothelial Cells to Epidemic Hemorrhagic Fever Virus

40091011c Shanghai ZHONGHUA CHUANRANBING ZAZHI [CHINESE JOURNAL OF INFECTIOUS DISEASES] in Chinese Vol 8 No 1, Feb 90 pp 10-14

[English abstract of article by Yi Jidong [2496 1376 2639], Chen Dehui [7115 1795 5610], et al., of the Institute of Basic Medicine, Academy of Military Medical Science]

[Text] The susceptibility of cultured human endothelial cells (HEC) to the epidemic hemorrhagic fever virus (EHFV) and its relationship to the pathogenesis of epidemic hemorrhagic fever (EHF) have been studied. Three strains of EHFV (Chen strain, A96 strain and R22 strain) were inoculated onto primary passage HEC monolayers. Two days after inoculation, a viral antigen within the cytoplasm of the infected cells was detected by the immunofluorescent technique. The viral titer increased consistently with the prolongation of the culture, peaking on the eighth day after inoculation. The results confirm that HEC is a susceptible target cell of EHFV. It has also been observed through phase contrast light microscopy and transmission electron microscopy that the EHFV infection in HEC did not cause any apparent cytopathogenic effects. It is suggested that the replication of EHFV in HEC may play an important role in the pathogenesis of EHF.

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DNA Polymerase Chain Reaction Serum Direct Assay in Detection of HBV DNA

40091011b Shanghai HONGHUA CHUANRANBING ZAZHI [CHINESE JOURNAL OF INFECTIOUS DISEASES] in Chinese Vol 8 No 1, Feb 90 pp 6-9, 14

[English abstract of article by Chen Yuanqing [7115 3220 0615], Yan Genbao [0917 2704 1405], et al., of the Shanghai Cancer Institute]

[Text] From the computer-stored records of known DNA sequences, the oligonucleotide primers A (459-482) and B (1039-1061) of HBc gene conserved sequences common in various subtypes have been synthesized, and a microquantitative assay using the polymerase chain reaction (PCR) directly from serum and gel electrophoresis for detection of HBV DNA has been established. With the use of this assay, 182 serum samples have been analyzed and compared with both serum spot hybridization assay (SHA) and reversed spot hybridization assay (RSHA) in a double blind fashion. Also, a reconstruction analysis using different concentrations of pBR322-HBV DNA as a template mixed with HBV-negative serum has been performed as a mock test to quantify the sensitivity of the assay. The results demonstrate that this assay is not only highly sensitive, but also accurate. As low as 10 fg of HBV DNA, equivalent to 3 x 10^3 Dane particles, in serum can be detected easily. Therefore, the sensitivity of this assay has been found to be at least 100 times higher than that of either SHA or RSHA.

Since the serum can be used directly without DNA extraction before PCR, and since radioactive isotopes are not required, it is obvious that it can feasibly be applied to clinical diagnosis and molecular epidemiologic survey for HBV infection.

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Pharmacokinetics of Dihydroqinghaosu Given Orally to Rabbits, Dogs

40091011a Beijing YAOXUE XUEBAO [ACTA PHARMACEUTICA SINICA] in Chinese Vol 25 No 2, Feb 90 pp 147-149

[English abstract of article by Zhao Kaicun [6392 0418 1317] and Song Zhenyu [1345 2182 3768] of the Institute of Materia Medica, Chinese Academy of Medical Sciences, Beijing]

[Text] Qinghaosu (QHS), also known as artemisinine and arteannuiu, has been isolated from the Chinese herb *Artemisia annua* L. It is highly active against both chloroquine-sensitive and chloroquine-resistant strains of *P. berghei* and has been approved by the Ministry of Health for the treatment of malaria. When QHS is treated with sodium borohydride, dihydroqinghaosu (DHQHS) results, the antimalarial activity of which has been enhanced several fold. This paper reports the pharmacokinetics of DHQHS, studied by means of the radioimmunoassay method.

When the drug was administered orally in tablet form to rabbits at doses of 10, 20 and 30 mg/kg, peak serum levels of 0.03, 0.05 and 0.13 μg/ml, respectively, were obtained in 1 to 2 hours. The corresponding $T_{1/2}$ of the drug was found to be 1.19, 1.00 and 1.10 hours, while the MRTs [mean reservation times] were 1.73, 1.36 and 1.53 hours. No significant differences between dosages used were observed. When dogs were administered DHQHS tablets at a dose of 20 mg/kg, a peak serum concentration of 0.13 μg/ml was reached in about 2 hours, with a $T_{1/2}$ of 2.10 hours and an MRT of 3.04 hours. However, when dogs were given QHS tablets at the dose of 70 mg/kg, no drug was detected in the serum. It would appear that the bioavailability of DHQHS tablets is much higher than that of QHS when administered orally to dogs.

Partial financial support was received from the UNDP/WORLD BANK/WHO Special Program for Research and Training in Tropical Diseases Under the SWG-CHEMAL, and from the Institute of Chinese Material Medica, China Academy of Traditional Chinese Medicine.

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New Reports on Thin-Film Zero-Resistance Temperature, SQUID Devices

90P60015 Zhengzhou HENAN RIBAO in Chinese 27 Apr 90 p 4

[Unsigned article: "China's High-Temperature Superconductivity Research Remains at World State-of-the-Art"]

[Summary] Beijing, 26 April (XINHUA)—In addition to the report by the Beijing Institute of Nonferrous Metals of a new high critical current density for a bulk superconductor—a value of 23,760 amperes per square centimeter at a temperature of 77K and in the presence of an external magnetic field with a flux density of 2 tesla [see JPRS-CST-90-015, 6 Jun 90, p 15]—other organizations are reporting major advances. The Northwest Institute of Nonferrous Metals, after a thorough study of the metallurgical, physical and chemical processes in yttrium-based superconductors, has created a new technique—the first such technique reported worldwide—for fabricating yttrium-barium-copper oxide (YBaCuO) materials: the powderized processing technique.

The Chinese Academy of Sciences' (CAS) Institute of Physics has reported that in January this year it developed a bismuth-strontium-calcium-copper oxide [BiSrCaCuO] thin-film superconductor with a zero-resistance temperature of 105K. This is the highest temperature reported by labs worldwide for such a superconductor.

Applied superconductivity is also in the news. Using a YBaCuO material, the China Metrology Research Institute [under CAS] has developed a superconducting quantum interference device (SQUID) with a magnetic flux sensitivity equal to one-25 millionth that of the Earth's magnetic field in the 10Hz to 100Hz range, as well as initial use of such a device in areas such as physical detection and measurement [also see JPRS-CST-90-008, 15 Mar 90, p 35]. Utilizing a thallium-barium-calcium-copper oxide material, Beijing University and Nankai University have jointly developed a DC SQUID with this same measurement accuracy. Only a small number of nations including the Soviet Union, the U.S., and Japan have been able to realize this device—still in the laboratory development stage worldwide—for detecting magnetic field strength.

Domestic Integrated Fiber-Optic Networks Described

Details on First Integrated Digital Network

90FE0091A Beijing DIANXIN JISHU [TELECOMMUNICATIONS TECHNOLOGY] in Chinese No 10, Oct 89 pp 2-3

[Article by Zhong Genheng [4429 2704 1854]: "First Domestically Made Integrated Digital Network"; note: for earlier report, see JPRS-CST-90-002, 17 Jan 90, pp 36-37]

[Text] Today, many countries are developing the two major technologies in modern communications: stored-program-controlled (SPC) digital [telephone] switching and fiber optics. In this country, a local digital network has been established using the domestically developed DS-2000 SPC digital exchange and the multimode long-wavelength fiber-optic PCM [pulse code modulation] DS3 [34 Mb/s, 480 voice circuits] optical communications system. This network has been linked with metropolitan public telephone networks to achieve digital transmission capability between exchanges. Actual operational results show that the system performance is stable and meets CCITT standards or national standards. A brief description of this network is given below.

I. Network Architecture

This integrated digital network (IDN) consists of five SPC digital exchanges and a five-segment DS3 multimode fiber-optic communications system; it is linked to the metropolitan public telephone networks via the SPC tandem office. Two of the five exchanges are the DS-2000 SPC exchanges, developed by Institute No 1 of the Ministry of Posts and Telecommunications (MPT); they are located in office B and office C respectively. The other three are the S-1240 exchanges, located in offices A, D, and E respectively. These five offices are linked by a five-segment, DS3 multimode fiber-optic communications system; they are also linked to local office 801, as shown in Fig. 1.

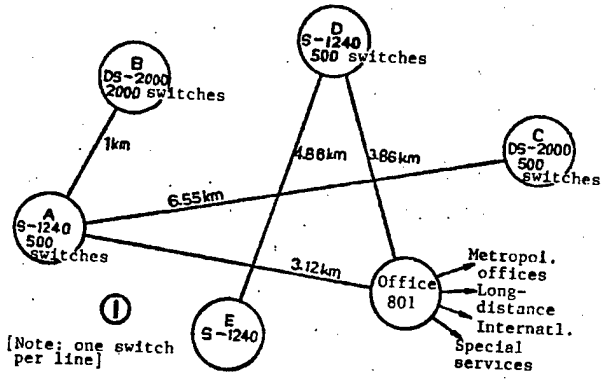


Figure 1

II. Operational Tests

1. Test of the SPC Digital Exchanges

Tests of the DS-2000 exchanges include the local performance test, the transmission system interface test, the signal-matching test, the load-capability test and the operational stability test. The test results are as follows:

(1) Local performance test. Full-scale tests were conducted to check the various functions of the exchange, including call-processing and connection capabilities, performance of the measurement platform and control platform, the maintenance and management function, the diagnostic function, and the alarm system. The test results of all functions were normal.

(2) Combined test with the fiber-optic communications systems. By linking the switching machines in office B and office C to the DS3 fiber-optic-cable communications system, a self-loop test was conducted with satisfactory results.

(3) Network-insertion and signal-matching test. Network insertion takes the form where local telephone, long-distance telephone and special services all share the same cable which is linked through office 801; this approach results in greatly simplified relay-line connections and improved line utilization. Test results show that this type of network insertion not only is feasible but also eliminates the "H" signal used in the tandem exchange.

(4) Load-capability test. Since offices B and C do not have a sufficient number of users to fully test the processing capability of the exchanges, a special test was conducted where simultaneous calls were processed using six analog calling units. The measured BHCA [busy hour call attempts] value from this test was 25.7k, the connection rate was 99.96 percent, and the CPU usage was 65.1 percent. The calculated CPU usage based on the design BHCA value of 24k would be 61.3 percent, which provides ample reserve capability.

(5) Operational-stability test. By monitoring the operation of office B during the first year, 45 printed circuit boards were found to be faulty; the faults were primarily due to component failures rather than defective soldering. However, after the first year, the number of faults decreased drastically: only seven faulty boards were discovered within 4 months. The average number of faulty boards per month for every four switches, 0.88, approaches the standard for imported SPC exchanges.

During operation, it was found that the digital signal receiver became unstable when exposed to a temperature of approximately 30°C for an extended period. This problem was solved by installing an axial fan on the receiver housing to provide improved ventilation. In the software area, there were 40 design faults and 15 software errors, but they have all been corrected. Actual operational tests have shown that the software runs in a basically stable fashion.

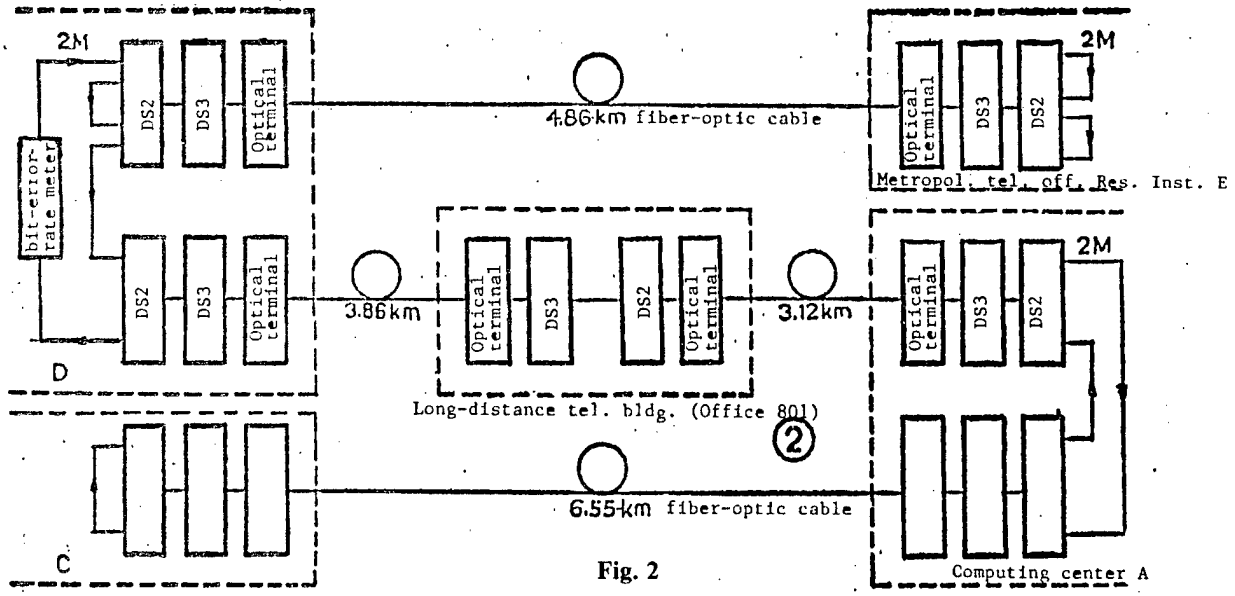


Fig. 2

2. Test of the Fiber-Optic-Cable Communications System

During the stability test, it was found that the attenuation of one of the fiber-optic splices exceeded the design specification, but all the other indices including the overall attenuation and the other splice attenuations met specifications.

(1) Electrical Terminals. The primary-rate [DS1,2Mb/s, 30 voice circuits] and the DS2 [8 Mb/s, 120 voice circuits] electrical terminals were built by the Chongqing Communications Equipment Plant and the DS3 terminals were built by the Shanghai Communications Equipment Plant. Tests conducted over the past few years have uncovered some problems with product quality, but these problems have been corrected after improvements made by the manufacturers.

(2) Optical Terminals. The DS3 optical terminal is a new product from recent research and development. In this application, two types of optical terminals are used: one has a light emitting diode (LED) as the light source and is primarily used in short-distance systems; the other has a laser diode (LD) as the light source and is primarily used on long-distance systems. Most of the performance indices of both types of optical terminals met CCITT requirements. The LD optical terminal, however, was unstable because the high transmitted power coupled with low attenuation over a short range caused the LD to operate in the non-linear region. Once the light source was changed to the LED, stable operation was achieved.

(3) Stability Observation. By connecting the four systems D-E, D-801, 801-A, and A-C at the 2M ports into a series loop (see Fig. 2) and observing the operation at office D for one month, we were able to determine the time of system unavailability to be 0.0329 percent, the amount of bit-error seconds in the digital channels to be 0.013 percent, and the amount of severe bit-error seconds to be 0.0068 percent; these performance data are all better than design requirements.

3. Network Transmission and Demonstration of Non-Voice Services

(1) The test circuit starts from the exchange in office D, links through a tandem junction in office A, and reaches office B; it passes through three SPC exchange stations and two segments of fiber-optic digital repeaters (see Fig.

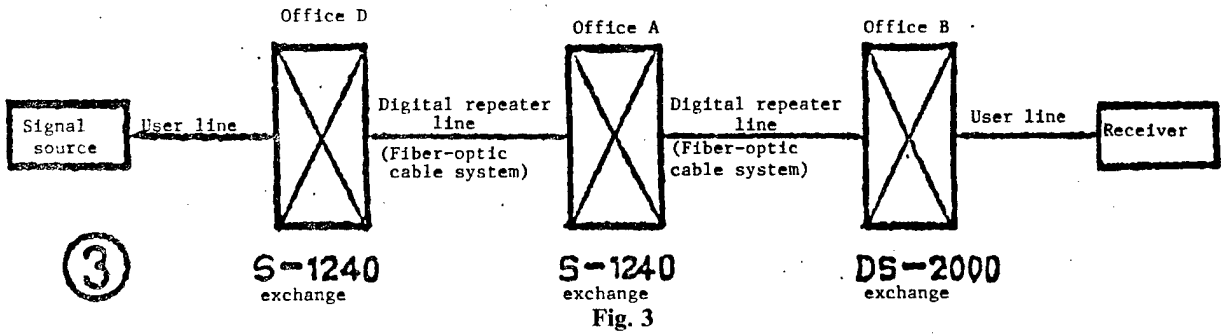


Fig. 3

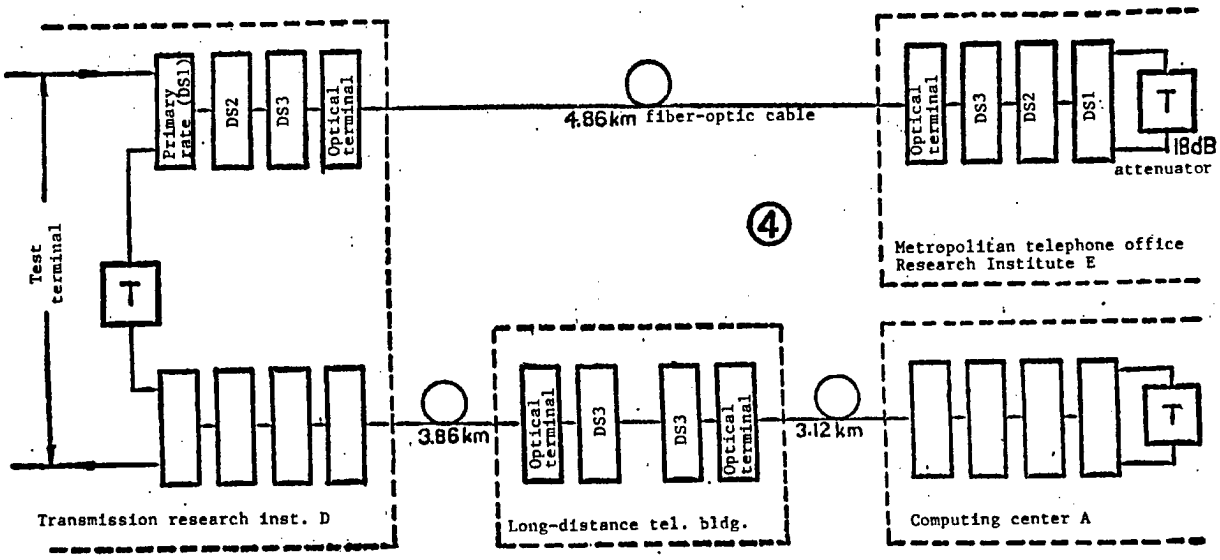


Fig. 4

3). The measured key indices of the audio channel such as transmission attenuation, frequency response, gain amplitude characteristics, and crosstalk all met CCITT specifications.

(2) Test of the transient characteristics of the transmission system. The circuit used for testing the transient characteristics of the transmission system was approximately 24 km long, and passed through three audio-frequency switches (see Fig. 4); the contents of the test included pulse noise, abrupt changes in amplitude and phase, and the 9600-bps bit error rate (BER). The test continued for 23 days for 8 hours per day; the test results were all superior to design specifications.

(3) Test of non-voice services. Three types of facsimile tests and 2400-bps BER tests were conducted through offices D, A, and B. The results showed that the three types of facsimiles can be transmitted at a rate of 9600 bps, and the quality is comparable to that of the local self-loop. The BER for 2400-bps two-line full duplex is generally less than $1x10^{-5}$.

Research and Development of Fiber-Optic Integrated Services LAN

90FE0091B Beijing DIANXIN JISHU [TELECOMMUNICATIONS TECHNOLOGY] in Chinese No 12, Dec 89 pp 2-6

[Article by Su Renyi [5685 0088 0308]: "Fiber-Optic Integrated Services Local Area Network"; see earlier report in JPRS-CST-90-002, 17 Jan 90, p 36]

[Text] The rapid growth in communications technology, computer technology, and large-scale integrated-circuit technology has accelerated the development of office automation and management automation. Communications technology is gradually shifting from the traditional form of services such as telephone and telegraph and toward the integrated services network (ISN), which includes graphics, audio (including voice signals and VCR sound-accompaniment signals), facsimiles, videotex, and data. In wired transmission, the best transmission medium for today's ISNs is optical fiber. Most developed countries are devoting a great deal of effort toward research on and development of fiber-optic ISN's. The Consultative Committee on International Telegraphy and Telephony (CCITT) is in the process of establishing a standard for the interfaces of ISNs used in international information exchange. In this country, significant progress has also been made in this area, and this article describes a domestically developed and manufactured fiber-optic integrated services local area network (LAN). Such a network can use a single optical fiber to simultaneously transmit four different types of information: one channel of color TV video signal, one channel of audio signal, one channel of facsimile signal (or another channel of audio signal), and one channel of data signal. It uses two different modes of optical modulation: frequency-domain/optical intensity modulation (FDM-IM), and square-wave pulse-frequency/optical intensity modulation (SWFM-IM). Both of these modulation systems share the same block diagram, shown in Fig. 1.

I. Capabilities of FDM-IM and SWFM-IM Fiber-Optic Integrated Services LAN

It is seen from Fig. 1 that ISN's with these two different optical modulation systems have a three-level management structure which consists of one central station, one management station and multiple workstations. The management station and the workstations are equipped

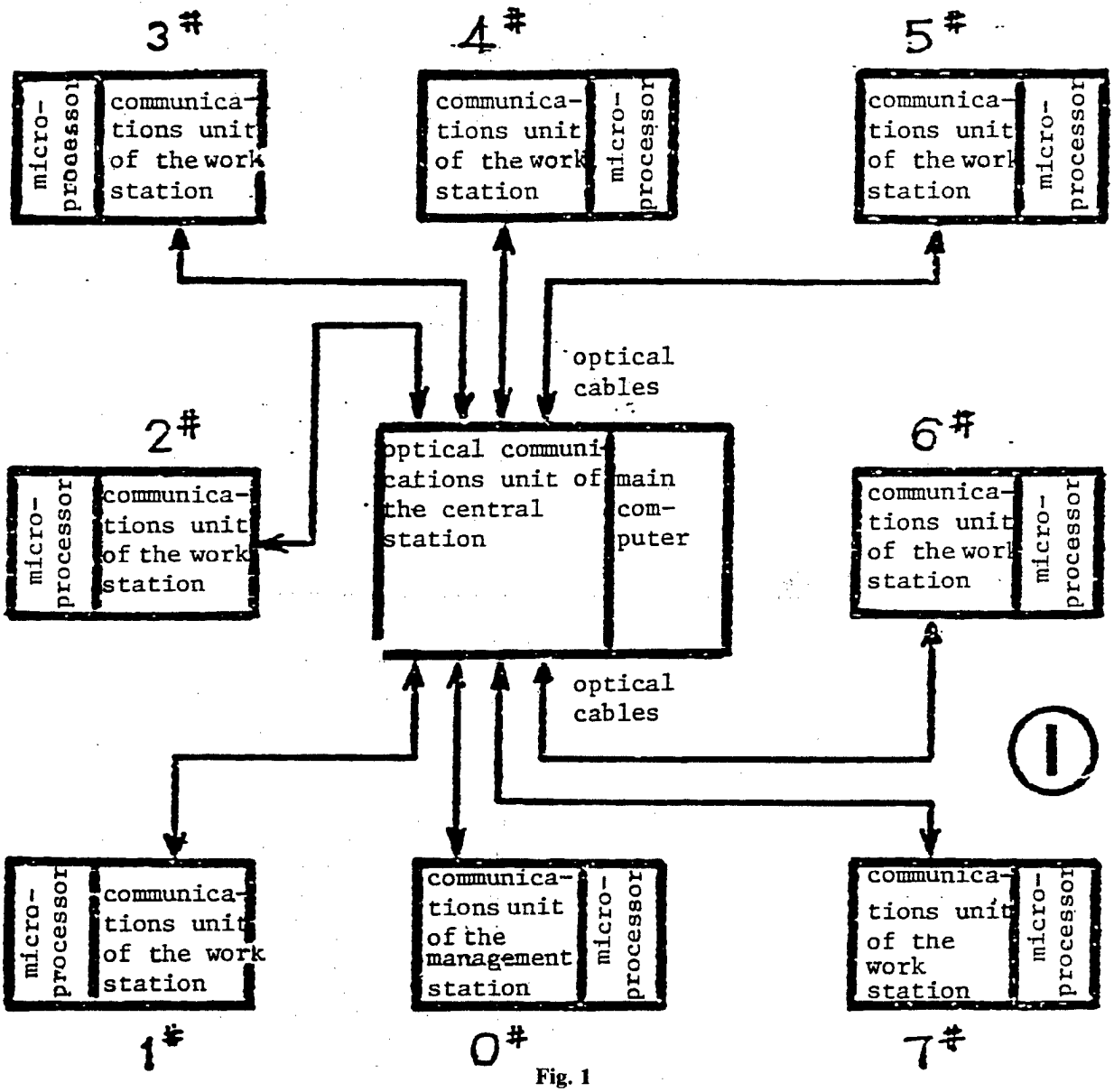


Fig. 1

with single-board microprocessors or microcomputers; the central station is equipped with a main computer which may vary in size from mainframe to minicomputer, depending on needs. The technical specifications of the network are given in Table 1. The capabilities of the network are described below.

1. Video Communications

In the duplex communications mode, each station can request permission from the central station to establish video telephone, videotex, voice, facsimile or data communications with other stations; it can also select and control the operation of the video cameras of the other stations. In addition, the TV signals, voice signals and facsimile signals can be separated from the data transmission and exchange channel to form two different networks: the graphics, voice and facsimile network and the data network. Therefore, it is possible for one station to carry on a video conversation with another station while transmitting, receiving, and verifying facsimile and data information at the same time.

2. Teleconferencing

Any station in the network can initiate a teleconference. Of course, the establishment of control commands and the transmission and exchange of information during the conference are executed by the main computer of the central station. Teleconferencing can operate either in a

		FDM-IM	SWFM-IM
Topology		Star shape	
Number of nodes		4、8、16……	
Mode of synchronization		asynchronous	
transmitted information		graphics, voice, facsimile, data	
light-source assembly		1.3μm LED-PIN	1.3μm LED-PIN LD
transmission range			
technical indices	graphics S/N ratio unweighted	greater than or equal to 50 dB, unweighted	
	DG	⩽±2%	
	DP	⩽±2°	
	audio or facsimile S/N ratio	greater than 50 dB	
	bit error rate	$<10^{-2}$	

Table 1

simplex mode or a duplex mode; the duplex mode is identical to that of video communications.

3. Television Broadcasting

Any station in the network can be linked to a cable television system to form a television broadcasting and videotex network. The television signals can also be switched through the central station and rebroadcast to other stations. In a TV broadcast network, the facsimile signals can be replaced by another channel of audio signals to form a dual-audio television broadcasting system.

4. Television Monitoring and Scheduling

The conditions of each work station can be transmitted via video camera to the central station, and the conditions of the central station can be transmitted to the management station. In this mode of operation, the network becomes a monitoring and scheduling network.

5. Data Transmission and Industrial Data Monitoring

The main computer of the central station and the computers of the management station and the workstations can be linked to form a data transmission and exchange network. This network can not only process the various command signals but also transmit and process the data communications signals. The workstation computers can also be used to monitor the industrial data from various sensors.

The disadvantage of the FDM-IM optical modulation system is that the transmission range is very short. For example, the maximum transmission distance for a 1.3-μm-wavelength multimode optical fiber is less than 8 km, but the maximum data rate can be as high as 2048 Mb/s. Therefore, the system is compatible with PCM-30, 2B+D or other PABX small exchanges, and can transmit and process various analog signals and high-data-rate digital signals. Even with the future development of the ISDN, it is still a very useful LAN.

II. Optical Communications Unit

The optical communications unit is a key segment of the fiber-optic integrated services LAN. The three different optical communications units for the workstations, the management station and the central station are described below.

1. Optical Communications Unit of the Workstation

A block diagram of the optical communications unit of the workstation is shown in Fig. 2. It consists of the following components: the optical transmission segment, the optical receiving segment, the microcomputer (or single-board microprocessor), the Yuntai [0061 0669, a place-name in Sichuan] remote-control segment and the camera-selection segment. The network design is based on the operation of eight cameras; the gating of each camera and the movement of the Yuntai are controlled by the station to which it is communicating. In the transmission segment, the video graphics signal of the camera is directly combined in baseband with the audio signal, the facsimile signal and the data signal, and converted into an optical signal which is then transmitted via optical fibers to the communications unit of the central station. The audio signal and the facsimile signal are frequency-modulated and then combined with the video graphics signal. For an FDM-IM optical-modulation LAN, the data signal is first ASK (amplitude shift key) modulated, and then combined with the video graphics signal, the facsimile signal and the audio signal. This is necessary in order to achieve a data rate of 2048 kb/s while simultaneously transmitting these four signals over a single optical fiber. For an SWFM-IM optical-modulation LAN, frequency modulation (FM) is used for economic and technical reasons, and the data rate is limited to approximately 20 kb/s.

The optical receiving segment is the inverse modulation of the transmission segment, and will not be described in detail here.

In Fig. 2, the blocks without dashed lines are part of the FDM-IM network; the blocks with both dashed and solid lines are part of the SWFM-IM network.

The primary function of the microcomputer of the workstation is to transmit and receive various command signals and to perform control and processing functions such as remote discrimination and control of Yuntai addresses and operation, establishment and termination of communications procedures, etc. In addition, when a local station submits a request to the central station to establish communications with a station in the network, but the central station determines that the line is occupied and returns a "busy" signal, the microcomputer of the local station will activate the audio alarm to produce a busy sound.

2. Optical Communications Unit of the Management Station

The optical communications unit of the management station is similar to that of the workstation. The only difference is that the workstation has a fixed display terminal whereas the management station has a scanning display; however, a fixed display can be provided if required. In network communications, the management station always has the highest priority.

3. Optical Communications Unit of the Central Station

The optical communications unit of the central station consists of the following segments: the optical-receiver demodulation segment, the terminating scanning and gating segment, the transponder processing and switching control segment, the originating electric-optical conversion segment, the input signal modulation and combination segment, and the main computer; a block diagram is shown in Fig. 3. Because the network has a star-shaped topological structure, all the information from the various stations is collected, displayed, exchanged, and retransmitted at the central station; in addition, information from the central station itself is also gated and transmitted. A description of each of the segments is given below.

The optical receiving and demodulation segment—its function is to receive and demodulate the optical signals transmitted from the management station and the workstations; there is provision to display the graphics signals after demodulation. The configuration of this segment is identical to that of the optical demodulation segment of the workstation.

The scanning and gating segment—this consists of the gating-signal generator, the gating-signal control line and analog switch, and the demodulation circuits and other lines for the graphics, audio, facsimile and data signals. After optical-electrical conversion, the graphics signal is amplified by the pre-amplifier and the main amplifier. In the case of a network with FDM-IM modulation, the graphics signal is separated by a 6-MHz low-pass filter; it passes through the amplifier circuit and the clamping circuit, and reaches the gating analog switch of the graphics scanning segment, where it is matched and sent to the display unit. In the case of a network with SWFM-IM modulation, the graphics signal is SWFM-IM demodulated, followed by shaping and de-weighting, then passes through analog switching and gating before output. The demodulation of the audio, facsimile and data signals is identical to that used in the workstations; the only difference is that the information from the various stations must be first gated through the gating switch before output. The gating control signal is provided by the main computer. Since the graphics, audio, facsimile and data networks are all independent, their gating control signals are also independent.

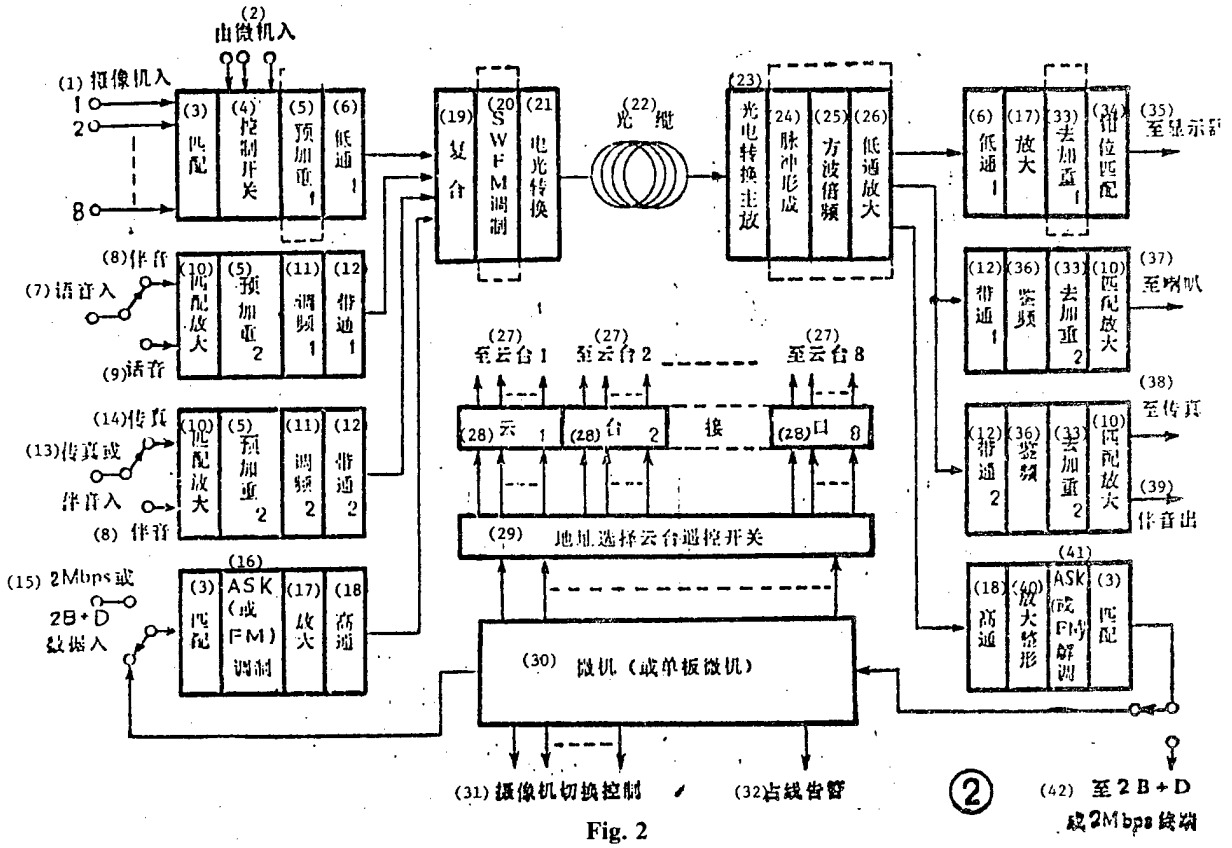


Fig. 2

Key:—1. Camera input—2. From microprocessor—3. Matching—4. Control switch—5. Pre-weighting—6. Low-pass—7. Audio input—8. Sound accompaniment—9. Voice—10. Matched amplification—11. Frequency modulation—12. Band-pass—13. Facsimile or sound-accompaniment input—14. Facsimile—15. 2 Mbps or 2B+D data input—16. ASK or FM modulation—17. Amplification—18. High-pass—19. Combination—20. SWFM modulation—21. Electric-optical conversion—22. Optical cable—23. Optical-electrical conversion primary amplification—24. Pulse formation—25. Square-wave frequency multiplication—26. Low-pass amplification—27. To Yuntai—28. Yuntai interface—29. Address selection and Yuntai remote-control switch—30. Microcomputer (or single-board microprocessor)—31. Camera switchover control—32. Occupied-line alarm—33. De-weighting—34. Clamp matching—35. To display—36. Frequency discrimination—37. To Speaker—38. To facsimile machine—39. Sound-accompaniment output—40. Amplification and shaping—41. ASK or FM demodulation—42. To 2B+D or 2 Mbps terminal

The transponder processing and switching control segment—this is a key segment of the network for implementing video communications, teleconferencing, television broadcasting, television monitoring and scheduling, data transmission, and industrial data monitoring. The primary function of transponder processing is to filter out the data information from the receiving segment, and re-combine it with the transmitted information at the transmission segment. The data exchange is accomplished using the circuit switching method; the selection and processing of the information exchange paths are carried out by the main computer. For example, when a workstation submits a request to establish communications with the management station, the main computer first determines the status of the management station.

If the management station is communicating with another station, then a "busy" signal is transmitted; if the management station is idle, then the main computer immediately establishes a communications (data) path between the two stations. Of course, in addition to automatic path-selection by the main computer, communications can also be established in the form of telephone calls.

The optical-modulation output segment—its main function is to perform electric-optical conversion and gating of the transponded signal, and to transmit the gated signal to the management station or workstations. The information from the central station itself is also gated after modulation and combination, and transmitted to the other stations.

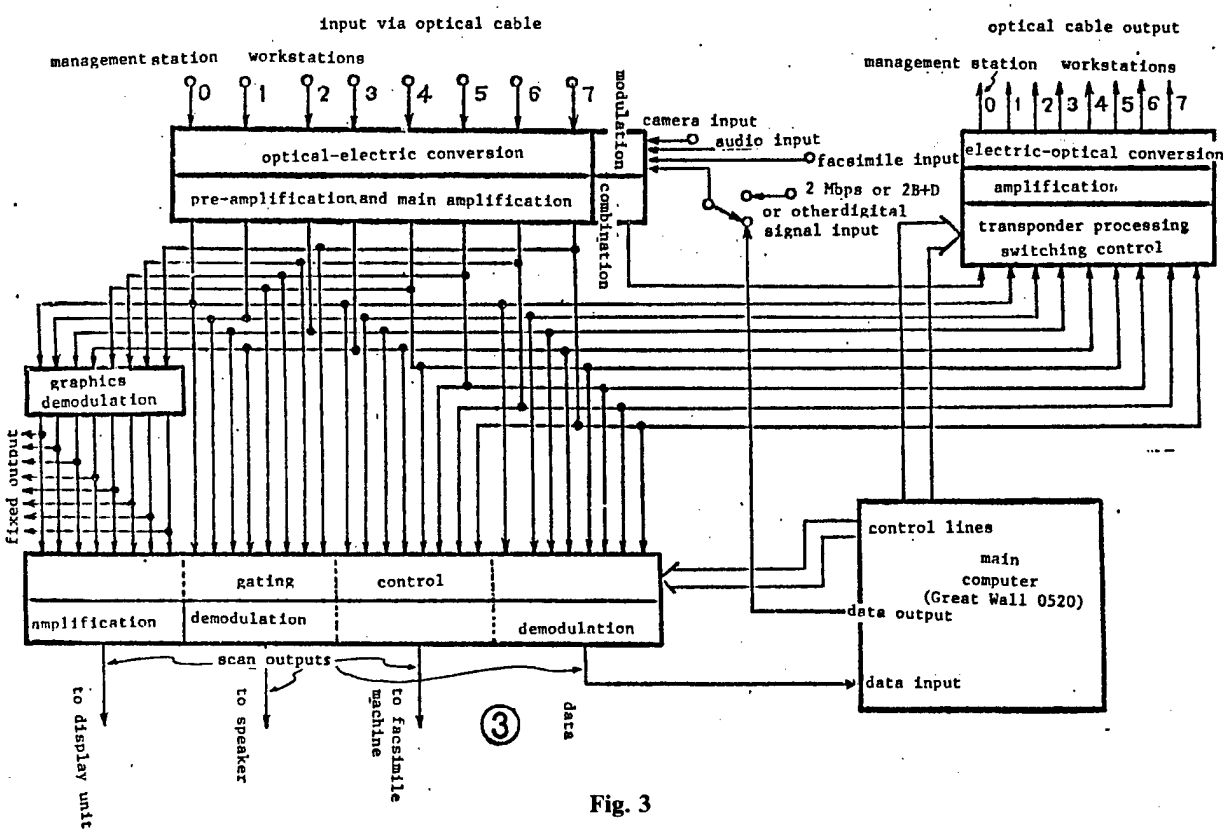


Fig. 3

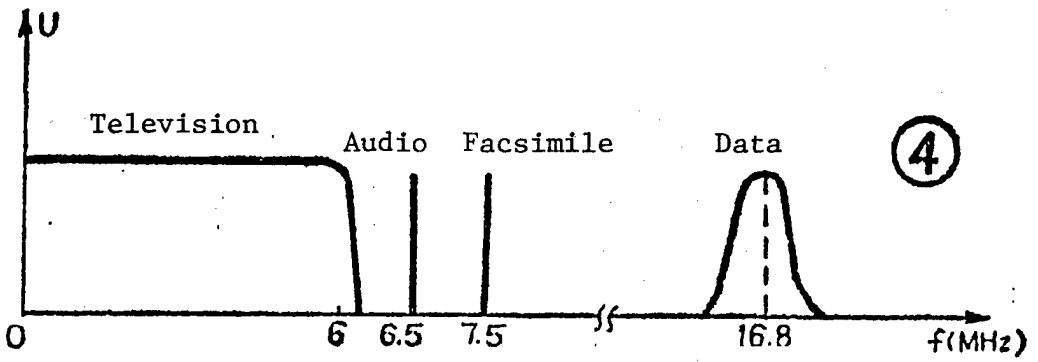
The main computer—its functions are: 1) to receive the data from the management station and the workstations, and to transmit the command control signals for transponder switching, teleconferencing, television broadcasting, etc., in accordance with the content of the input data, and to automatically select a communications path between the stations; 2) to transmit its own command signals and establish communications with the stations. Data transmission is carried out in a parallel mode.

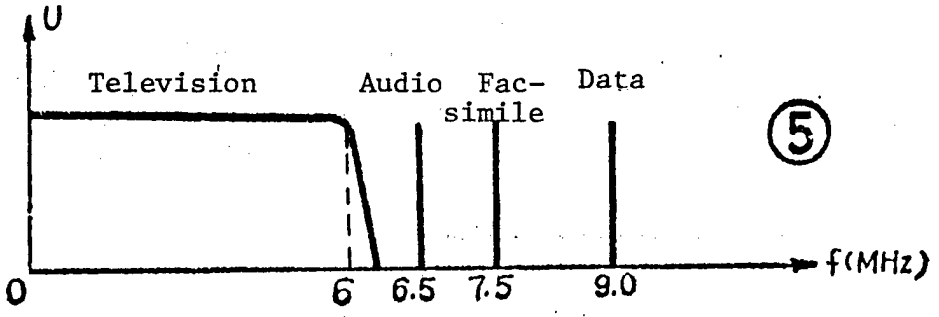
In using FDM-IM modulation, the frequency spectrum of the information is shown in Fig. 4. The bandwidth of the graphics baseband is 6.0 MHz; the audio and facsimile signals are frequency-modulated about a carrier frequency of 6.5 MHz and 7.5 MHz, respectively; the maximum rate of data transmission is 2048 kb/s, its carrier frequency is chosen to be 16.8 MHz, and it is ASK-modulated and FDM [frequency-division multiplexing] combined with the other information prior to transmission; therefore, the total transmission bandwidth is approximately 22 MHz. The distribution of the SWFM-IM modulated signal in the frequency domain is shown in Fig. 5. In particular, the distributions of the graphics, audio, and facsimile signals are identical to those of the FDM-IM modulation system; the data signal is first frequency-modulated about 9.0 MHz, and combined with the other three signals, after which the combined signal is again frequency-modulated about a carrier frequency of 36 MHz. The modulation index is approximately 1.

III. Computer System

1. Capability of the Microcomputer Control System

The slave computers of the management station and the workstations and the master computer of the central station constitute the computer control system. The network has a star-shaped topology, with a master/slave-type data transmission architecture. In addition to the independent networks between computers, each station can also transmit other information to the central station on a point-to-point basis. The workstation has the capability to switch-over the local-station cameras and has remote-control Yuntai capability; hence there is only a loose coupling between the master and slave computers. If a malfunction develops in the master computer, the slave computers can still maintain normal operation until the master computer recovers and regains control of the slave computers; thus, the network would never collapse due to a failure in the master computer.





Figs. 4 and 5

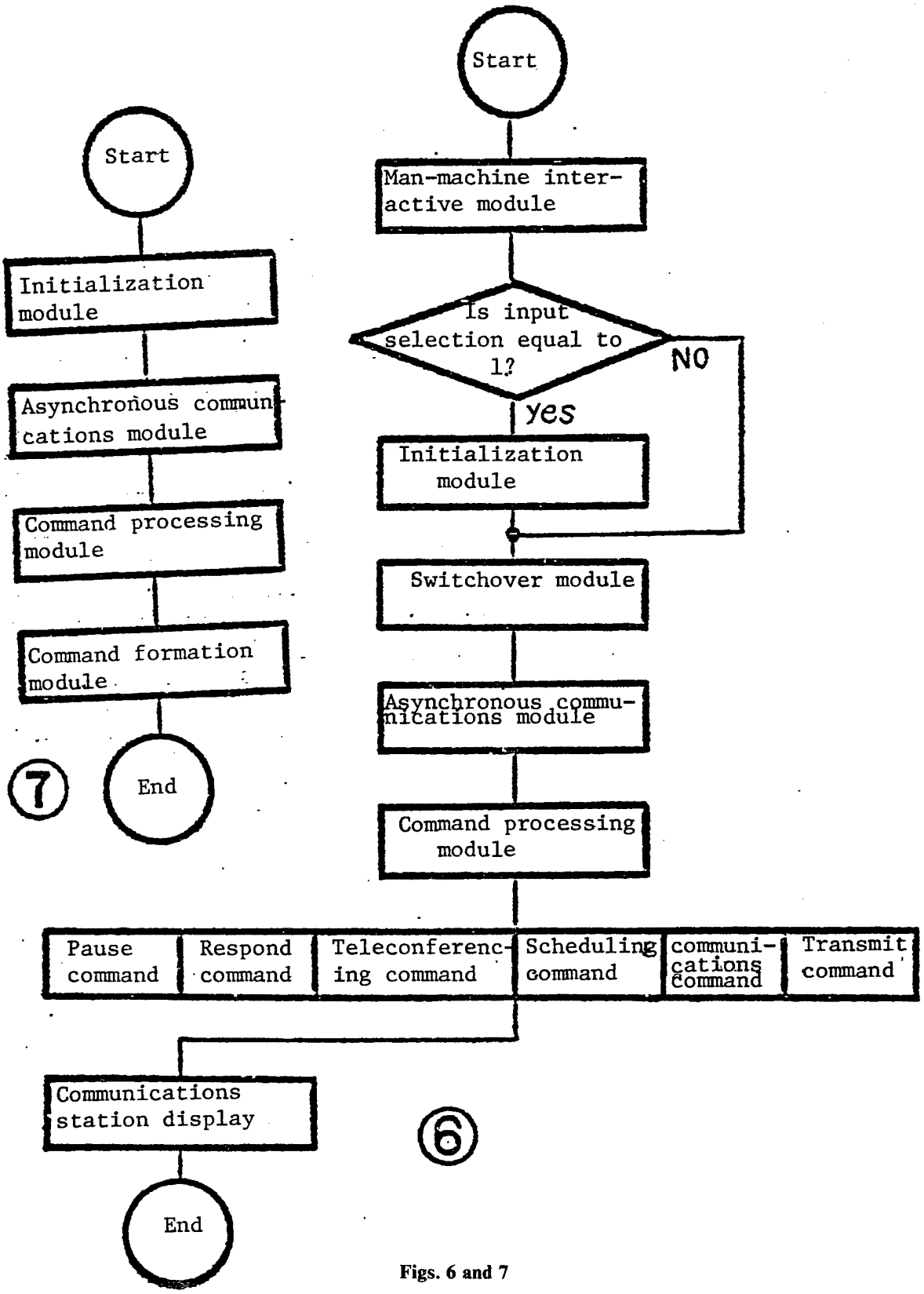
2. Software and Hardware Design of the Master and Slave Computers

Since the system is an integrated application of optical communications technology and computer technology, computer hardware is part of the communications equipment design. Here, the Chinese-built Great Wall 0520 computer is used as the master computer; its asynchronous communications input/output voltage uses the EIA RS 232C standards. All the slave computers are CMC-80 single-board microprocessors and use TTL [transistor-transistor logic] standards. Therefore, the interface circuit requires a voltage conversion. Also, the gating signal and control signal required by the interface circuits between the computers are provided by an interface circuit added to the Great Wall 0520 CH computer.

The system software design is divided into three parts: user program design on the master computer, applications program design on the slave computers, and management program design on the management microcomputer.

The flow chart of the user program on the master computer is shown in Fig. 6. To facilitate operation, the man-machine-interaction module is written in BASIC language; the commands are keyed into the computer in menu form and then transmitted to the slave computers of the workstations. The other modules are written in 8088 assembly language to increase data speed.

The flow chart of the applications program on the slave computers is shown in Fig. 7. Since the CMC-80 microprocessor is not designed to operate in the man-machine interactive mode, the processing program must be modified while using existing command keys in order to meet overall system requirements. The management program on the microcomputer of the management station is similar to that of the workstations.


Start
Initialization module
Asynchronous communications module
Command processing module
Command formation module
End
7
Start
Man-machine interactive module
Is input selection equal to 1?
NO
yes
Initialization module
Switchover module
Asynchronous communications module
Command processing module
Pause command
Respond command
Teleconferencing command
Scheduling command
communications command
Transmit command
Communications station display
End
6

Figs. 6 and 7

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